

(12) UK Patent Application (19) GB (11) 2 303 045 (13) A

(43) Date of A Publication 12.02.1997

(21) Application No 9813654.4

(22) Date of Filing 28.06.1996

(30) Priority Data

(31) 9502492

(32) 07.07.1995

(33) SE

(71) Applicant(s)

SCA Mölnlycke AB

(Incorporated in Sweden)

S-405 03 Göteborg, Sweden

(72) Inventor(s)

Marie Johansson

Anna Karin Jönbrink

Anders Gustafsson

(74) Agent and/or Address for Service

Boult Wade Tennant

27 Funnival Street, LONDON, EC4A 1PQ,

United Kingdom

(51) INT CL⁵

A61F 13/15

(52) UK CL (Edition O)

A3V V1B3A1 V1B3A2 V1B3B

(56) Documents Cited

GB 2227923 A

GB 2164542 A

EP 0323634 A2

US 4895569 A

US 4834742 A

US 3916901 A

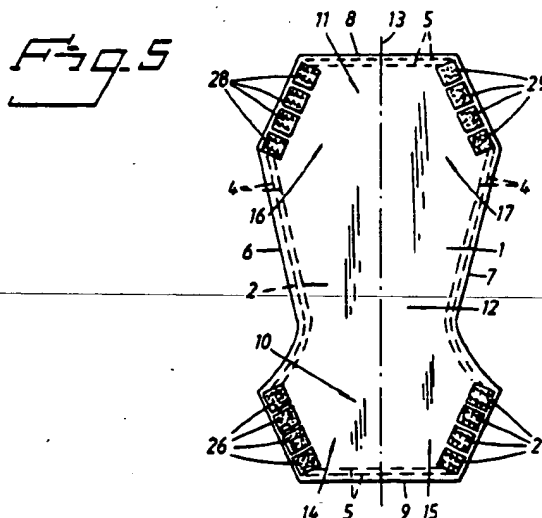
(58) Field of Search

UK CL (Edition O) A3V

INT CL⁶ A61F 13/15

(54) A fastener system for an absorbent article

(57) A bifurcated absorbent article such as a diaper comprises an arrangement of fasteners 26-29 which enables the end parts 10,11 of diaper in use to be fastened to each other around the wearer's waist and also allows the diaper to be rolled up or folded up after use and the sides fastened together for disposal. The arrangement is such that any one fastener e.g. 26 is able to be connected to either of corresponding fasteners 27,28, located laterally and longitudinally respectively of the fastener 26. The fasteners 26-29 may be of the hook and loop type, press studs or poppers, buttons and button holes, or profiles of coacting S-shaped and U-shaped profiled parts (figures 12 and 13, not shown). The fasteners may all be on the same side of the diaper for ease of manufacture.



1 / 6

Fig. 1

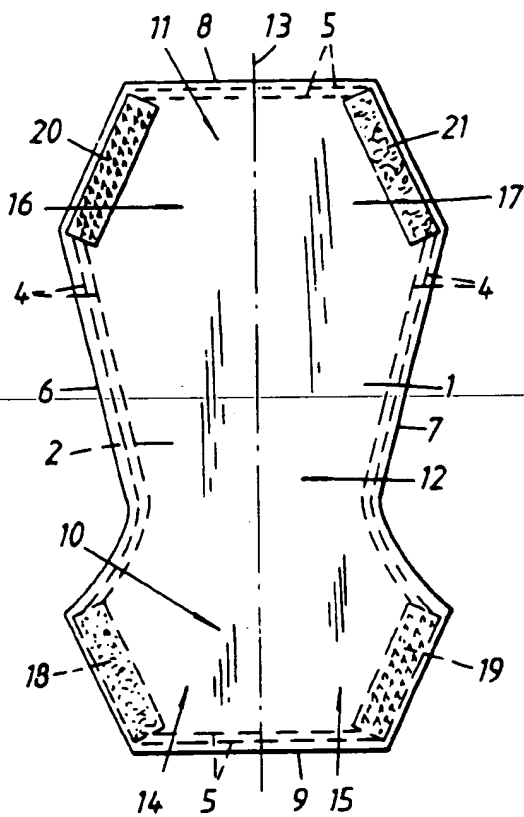


Fig. 4

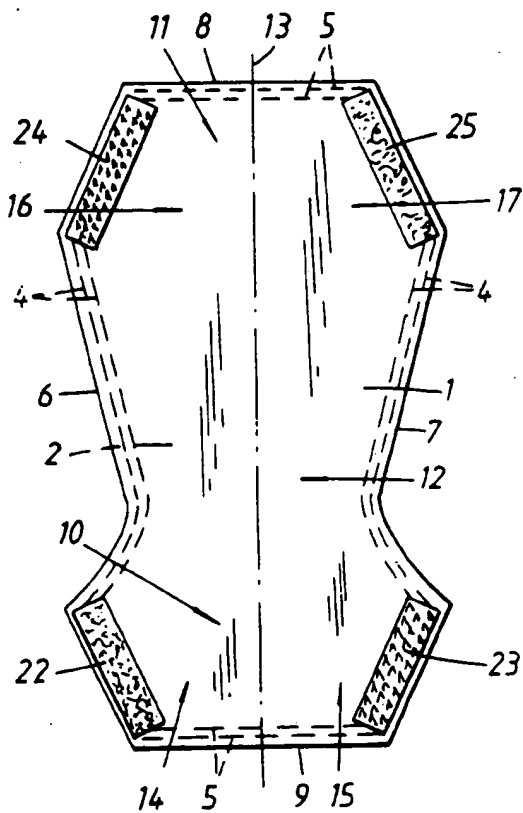


Fig. 2

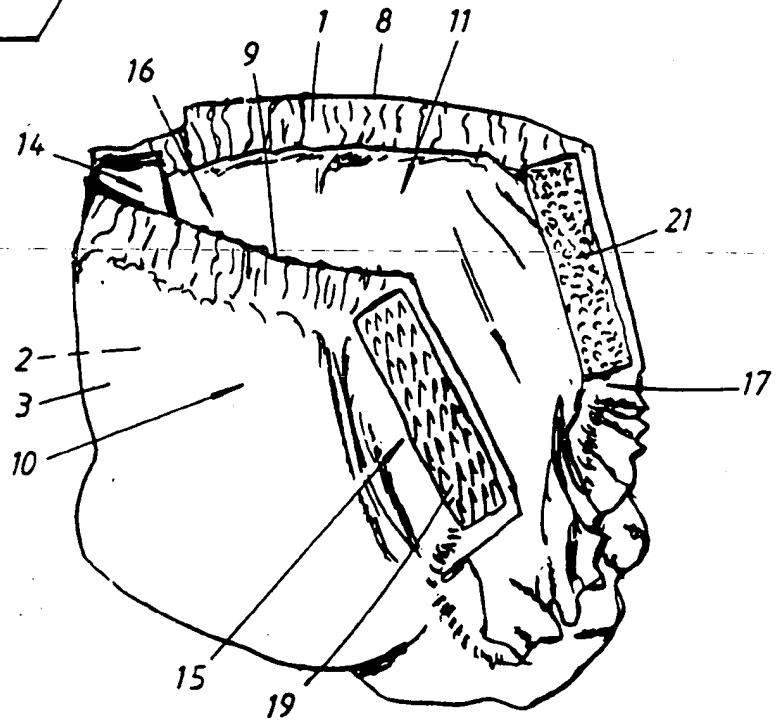


Fig. 3

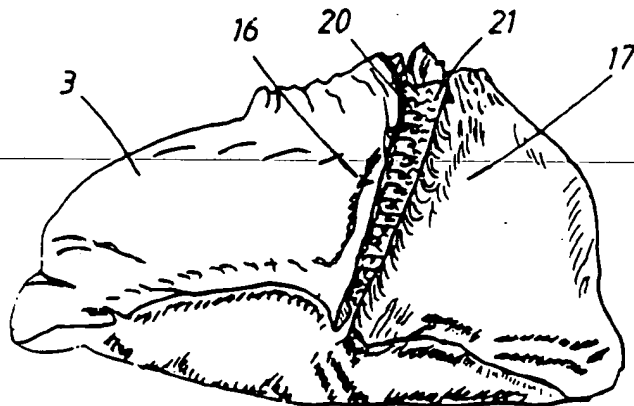


Fig. 5

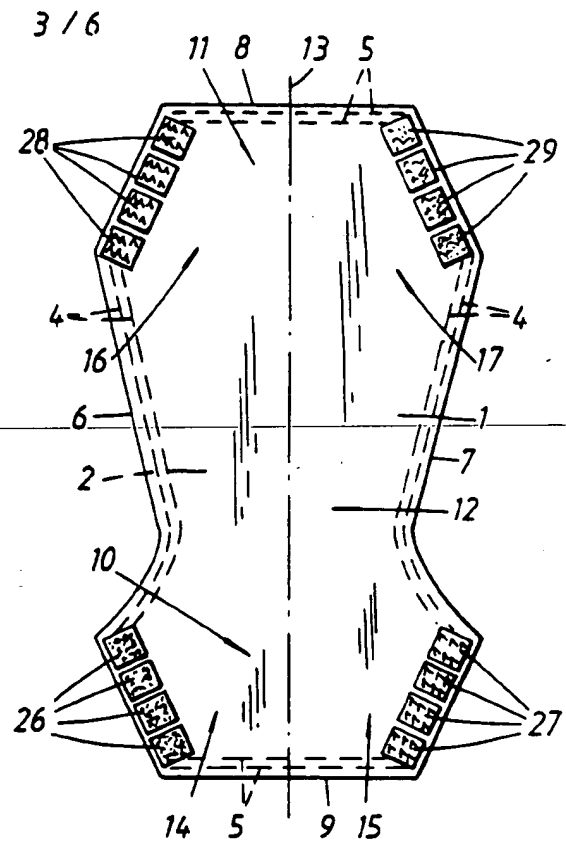


Fig. 6

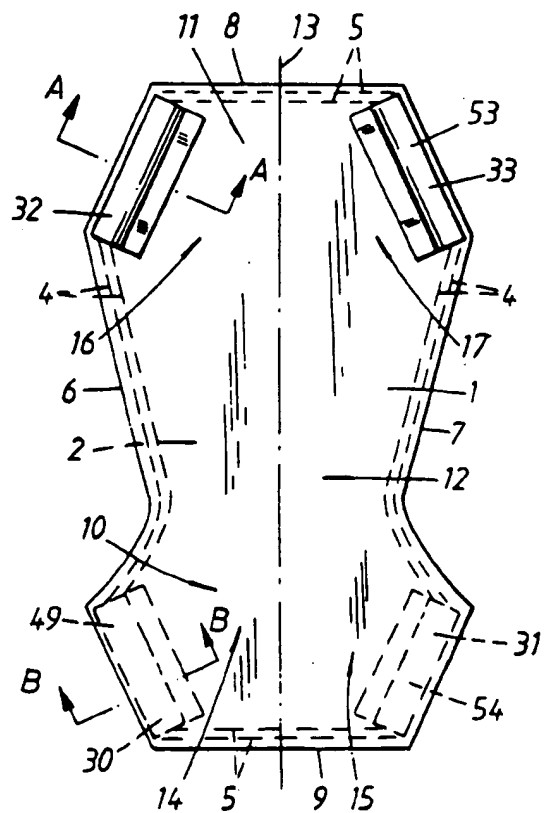


Fig. 7

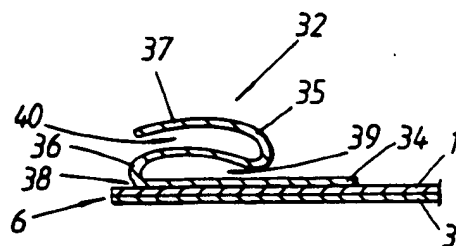


Fig. 8

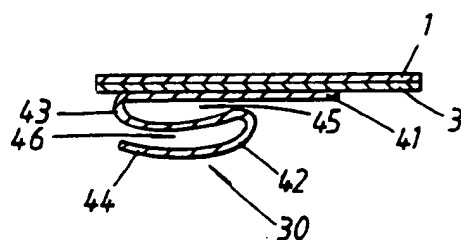


Fig. 9

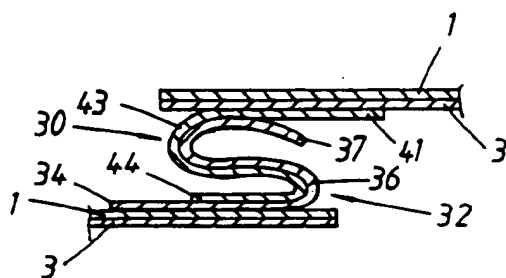


Fig. 10

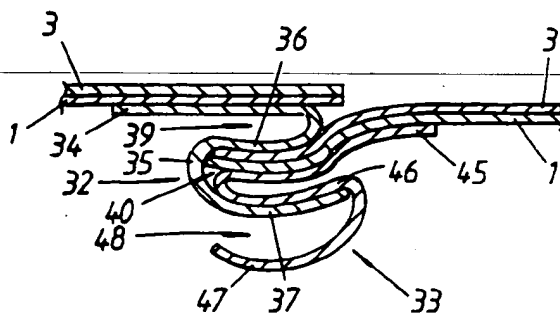


Fig. 11

5 / 6

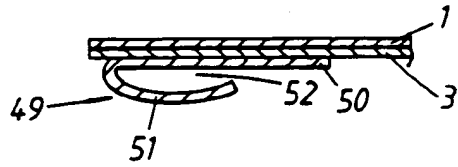


Fig. 12

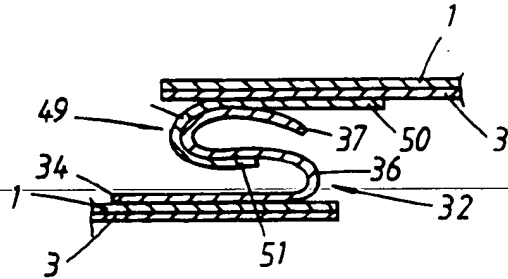


Fig. 13

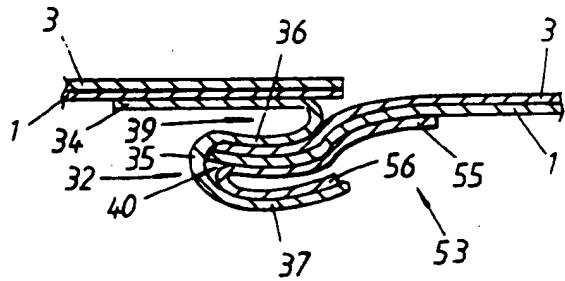


Fig. 14

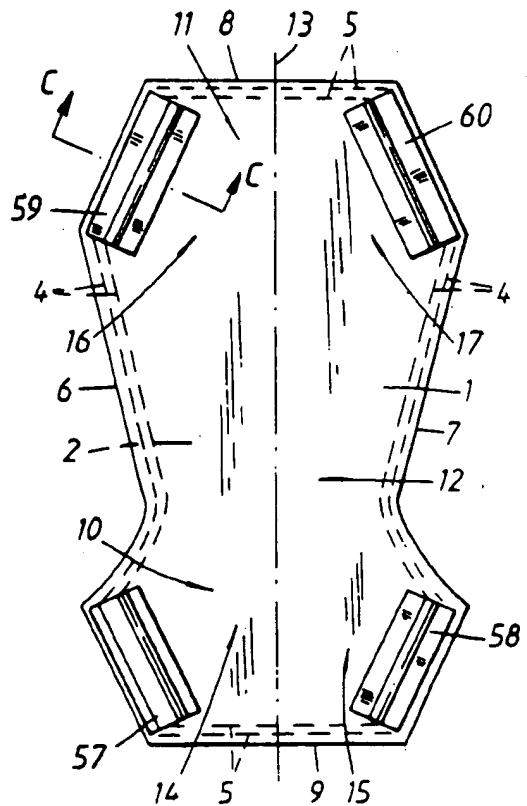


Fig. 15

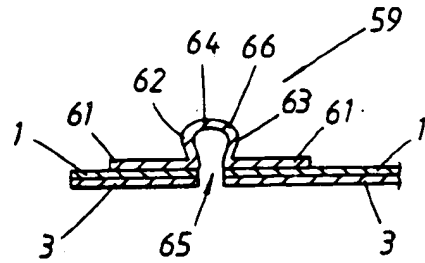


Fig. 16

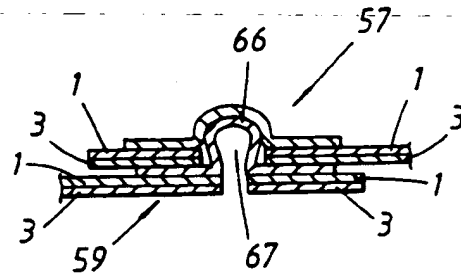
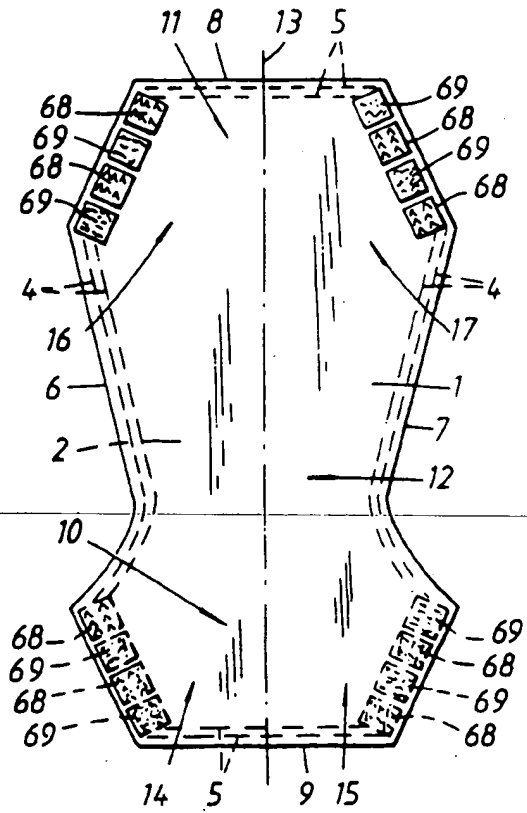


Fig. 17



AN ABSORBENT ARTICLE PROVIDED WITH A FASTENER SYSTEM

TECHNICAL FIELD

5 The present invention relates to an absorbent article, such as a diaper or an openable and re-closable pants-type diaper, comprising first and second sides which when the article is worn are intended to lie proximal to and distal from the

10 wearer's body respectively, first and second end-parts which when the article is worn are intended to lie respectively against the front-part and the rear-part of the wearer, and a crotch part which is located between said two end-parts and which when the article is worn is intended to be located between the wearer's thighs, wherein the article further

15 comprises a fastener system by means of which the end-parts of the article can be brought together to an assembled or closed pants-like configuration from a non-assembled or open configuration or which enables the end-parts to be loosened from an assembled or closed pants-like configuration to a

20 non-assembled or open configuration, wherein the fastener system includes mutually coacting fastener devices, wherein the article includes two side-edges which in the non-assembled state of the article delimit its transverse extension, wherein in the non-assembled state of the article each end-

25 part includes an end-edge which delimits the longitudinal extension of said article, and wherein the article includes a contemplated longitudinally extending line which passes from one end-edge to the other end-edge centrally between the side-edges such as to divide each respective end-part into

30 a first and a second side end-part.

Among other conceivable products with which the invention can be suitably applied are pants-type sanitary napkins for menstruating women and pants that are intended to support

35 absorbent inserts and intended for one-time use only or for repeated use, primarily those intended for one-time use only. It is particularly preferred to apply the invention with

absorbent articles that are intended for one-time use only.

BACKGROUND OF THE INVENTION

5 Absorbent articles such as child and adult diapers have long been provided with fastener systems by means of which the user or the user's nurse, minder, can bring different parts of the diaper, for instance the front and rear parts of the diaper, into more or less close abutment with the user's
10 body, so that the diaper will take a pants-like configuration around the wearer's body. The fastener system can also be released, to enable the diaper to be removed after use.

15 Examples of such fastener systems include individual pants or a triangular sheet which supports an absorbent insert so that said insert will face towards the wearer's body in use. Other fastener systems include article-mounted fastener devices by means of which the front and the rear parts of the article can be joined together. Examples of such fastener
20 systems are adhesive coatings and mechanical fastener devices. These latter devices may, for instance, consist in press studs, buttons and button holes or so-called touch-and-close fasteners, ie loop and hook fasteners. Both adhesive and mechanical fastener devices may be provided on fastener
25 tabs mounted on the article, suitably in the vicinity of its two corner parts.

30 Examples of diapers provided with such adhesive fastener tabs are described in Swedish Patent Specification SE 446 056. The diaper according to SE 446 056 is also provided with one or more plastic strips mounted on the end of the diaper opposite the end on which the fastener tabs are arranged. When using the diaper, the plastic strip or plastic strips are used as an anchorage surface for securing the fastener tabs. The
35 nature of the plastic strip is such as to enable the fastener tabs to be released therefrom without damaging the adhesive coating on the fastener tabs or the plastic strip. This

enables the fastener tabs to be refastened to the plastic strip, for instance after having opened the diaper to see whether or not it needs to be changed. This fastener system has the added advantage of enabling a removed, soiled diaper to be rolled up, folded or packaged in some other way with the plastic backing sheet facing outwards and to be effectively secured and sealed with the aid of the fastener system, so that no urine or faeces are able to escape from the packaged diaper. Since a diaper in this state is not intended for further use, it is not necessary to ensure that the fastener tabs can be released undamaged more than once. Consequently, when closing and sealing the aforesaid "package", the adhesive fastener tabs can be fastened to any suitable part of the diaper backing sheet whatsoever, and thus also surfaces from which the fastener tabs cannot be loosened without causing damage to the backing sheet or to the adhesive coating on the fastener tabs.

It is known to use mechanical fastener devices as an alternative to adhesive diaper fastener means. European Patent Specification EP 0 235 014 B1 is an example of the patent literature relating to diapers provided with mechanical fastener tabs. The fastener system described in this publication is largely similar to the fastener system disclosed in SE 446 056, but, of course, with the difference that the fastener means is a mechanical means, more specifically a touch-and-close, hook-loop type fastener.

Another example is found in European publication EP 0 321 234 A1, which describes a mechanical fastener system for articles intended for one-time use only and provided with means to enable the article to be discarded in a convenient manner. It is reported that this patent application is based on the observation that in the case of a typical touch-and-close fastener, the hook-pile of the fastener is mounted on a first end-part of the article while the loop-pile is disposed on another end-part of the article. It is maintained that the

loop-pile normally folds or rolls in under other parts of the article to be hidden thereby, so as not to be exposed and accessible to the loop-pile when the article is being packaged for disposal after use. The proposed solution to this problem is to provide the article with disposal means which enable the article to be closed and sealed in a "disposal state". The disposal means can have different forms. According to one preferred embodiment, an extra fastener device is mounted on the rear side of at least one of the fastener tabs, so as to enable the extra fastener device to be fastened to the front side of the other fastener tab, after bringing the article to a "disposal state".

The problem described in EP 0321 234 A1 and the solution proposed therein obviously assume that the article must be folded or rolled-up in a certain way after use, viz so that one of the components of the fastener system will be located in an inaccessible position which makes it impossible to secure this component to the other component of the fastener system. In this regard, it would seem necessary to mount fastener components of mutually the same kind in a conventional manner, i.e. in the same respective end-parts and on the same side surface of the diaper. It would also seem that the fastener components must have a very small extension over respective side surfaces of the diaper, and that the diaper backing sheet must be comprised of a plastic film against which the fastener components are unable to fasten. When such a diaper is rolled together (in the manner that a carpet is normally rolled-up), beginning from the end-part that includes the loop-pile fastener devices as described in EP 0 321 234 A1, the user will find that he or she has rolled these devices into the middle of the diaper roll, without any part of said devices projecting forwards on the exposed outer side of the roll. In this state of the diaper, the hook-pile of the fastener devices is no longer able to fasten to the loop-pile devices and not against the diaper backing sheet either. The inventors connected with EP 0 321 234 A1 then

find that it is necessary to increase the number of existing fastener components for closing a diaper in this rolled-up state. This will, of course, increase material consumption and therewith make the article more expensive. When needing to include additional fastener components, the difficulty arises as to where these components shall be best positioned so as to enable them to be used correctly by the user. It is unlikely that all users will handle a used diaper in a mutually similar fashion when disposing of the diaper after use. The provision of a further fastener component or several more fastener components on the article will add further procedures to the article manufacturing process, making manufacture more complicated. Another way of solving the problem would be to substantially increase the extension of the existing fastener components across the side surfaces of the diaper, instead of increasing their number. However, this also results in higher material consumption. Because the thickness of the outer casing sheet is increased over a large part of its surface as a result of extending the fastener components, the article will be stiffer and therewith less pliable and also less comfortable to wear.

It should be mentioned for the sake of completeness that a diaper according to EP 0 235 014 B1 can, of course, be closed and secured in a rolled-up state after use, but only when the diaper is rolled-up from the end in which the hook and loop fastener tabs are mounted. When the diaper is rolled-up in this way, the loop and hook receiving strip or strips will be accessible to the hook and loop devices. The same diaper may, of course, also be closed after use, by fastening the hook and loop devices to the receiving strip in the same manner as that applied when the diaper is donned. In this case, however, it is necessary to refrain from encapsulating the faeces on the surface of a soiled diaper in the more compact fashion afforded by the rolling-up procedure.

**THE OBJECTS OF THE INVENTION AND ITS MOST IMPORTANT
CHARACTERISTIC FEATURES**

5 An object of the present invention is to provide an improved
mechanical absorbent-article fastening system.

Another object of the present invention is to solve the
problem of closing an absorbent article with the aid of a
mechanical fastener system both during use and after use.

10

A further object of the present invention is to provide an
absorbent article having a mechanical fastener system which
can be used to close the absorbent article during use and
after use and which utilizes as few components as necessary
15 or whose extension is not greater than that required to
function effectively in both cases.

20

These objects are achieved with an absorbent article of the
kind mentioned in the introduction which is characterized in
that at least one of the end-parts on one and the same first
or second side of the article includes a fastener device in
the first side end-part, said fastener device or fastener
devices being able to coact with one or more fastener devices
on the second side end-part of the same end-part, and in that
25 respective side end-parts of one end-part include a fastener
device that can coact with a fastener device on the second
end-part of side end-parts on respective same sides of a
contemplated line between the end-edges.

30

The present invention provides an article which utilizes the
same fastener devices for closing and securing the article
both during and after use in a highly cost-effective manner,
without needing to provide fastener devices that are particu-
larly intended for this latter purpose or without needing to
35 give the fastener devices an unnecessarily large surface
area. The present invention thus provides advantages from an
economical aspect and also with regard to the use of resourc-

es. The present invention enables the article to be folded or rolled-up after use in several ways, although while always ensuring that two fastener devices will be available for fastening against one another and therewith close and secure the diaper in its folded-up or rolled-up state. It is also very beneficial to the user not to need to keep track of more fastener devices than necessary, and the present invention therefore makes the article very easy to use.

10 According to one preferred embodiment of the invention, the fastener system includes at least two types of fastener devices which are able to coact with fastener devices of a different type.

15 According to one particularly preferred embodiment of the invention, the first side end-part of the first end-part of the diaper is provided with at least one first type of fastener device, and the second side end-part of said first end-part is provided with at least one second type of fastener device; and in that the second end-part is provided with fastener devices of the first and the second type in reversed relationship with the imaginary centre line in comparison with the fastener devices on the side end-parts of the first end-part.

25 According to another embodiment of the invention, the fastener system includes a first type of fastener device that can coact with a second type of fastener device, wherein this second fastener device can also coact with a third type of fastener device, wherein the first side end-part of the first end-part includes at least one first type of fastener device and the second side end-part on the opposite side of said contemplated centre line includes at least one second type of fastener device and the second end-part includes a second type of fastener device on a side end-part located on the same side of the contemplated centre line as the first side end-part, and wherein the second end-part includes a third

type of fastener device on the side end-part located on the second side of the contemplated centre line relative to the first side end-part on the first end-part.

- 5 The fastener devices may all be mounted on the same first or second side of the article on its first end-part, whereas the fastener devices on the second end-part are mounted on opposite first or second sides of the article in relation to the fastener devices on the first end-part.

10

The fastener devices are preferably comprised of mechanical devices, for instance touch-and-close fasteners, press studs, preferably vacuum-formed press studs, buttons and button holes, or profiles of inverted S-shaped or S-shaped cross-section, or U-shaped profiled parts. The fastener devices may
15 also comprise a fastener device of the kind with which said device can coact with a similar fastener device, for instance with an S-shaped profiled part or an inverted S-shaped profiled part.

20

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail with reference to exemplifying embodiments thereof and also with
25 reference to the accompanying drawings, in which

Figure 1 illustrates a first embodiment of an inventive diaper schematically from above;

30

Figure 2 is a perspective view of the diaper shown in Figure 1 in its intended state of use, with the front and the side end-parts of the right-hand of the diaper joined together, but with the two end-parts of the left-hand side of the diaper being shown separated from one another for the sake
35 of illustration;

Figure 3 illustrates the diaper of Figures 1 and 2 in a

rolled-up state, with the two fastener devices on the rear end-part of the diaper mutually connected;

Figure 4 illustrates a second embodiment of an inventive
5 diaper schematically from above;

Figure 5 illustrates a third embodiment of an inventive
diaper schematically from above;

10 Figure 6 illustrates a fourth embodiment of an inventive
diaper schematically from above;

Figure 7 is a cross-sectional view taken on the line A-A in
Figure 6 and illustrates schematically one of the fastener
15 devices on the diaper shown in said Figure;

Figure 8 is a cross-sectional view taken on the line B-B in
Figure 6 and illustrates schematically another of the
fastener devices on the diaper shown in Figure 6;

20 Figure 9 illustrates schematically the coaction between the
two fastener devices shown in Figures 7 and 8 in the contemplated use configuration of the diaper;

25 Figure 10 illustrates schematically the coaction of the
fastener device of Figure 7 with said other fastener device
on the same end-part when closing the diaper to form a
disposal package after use;

30 Figure 11 is a cross-sectional view of a type of fastener
device different to that shown in Figure 8, said view being
taken on the line B-B in Figure 6, this fastener device being
in accordance with a variant of the fourth embodiment;

35 Figures 12 and 13 illustrate respectively coaction of the
fastener device shown in Figure 7 with a fastener device of
the type shown in Figure 11, when the diaper is in use and

after use, this coaction being similar to the coaction shown in Figures 9 and 10;

Figure 14 illustrates a fifth embodiment of an inventive
5 diaper schematically from above;

Figure 15 is a cross-sectional view of the fastener devices shown in Figure 14 taken on the line C-C in said Figure;

10 Figure 16 is a cross-sectional view of the fastener device shown in Figure 15 with said device fastened to the fastener device located on the opposite end-part on the same side of the article, in a manner corresponding to that shown in Figure 9; and

15 Figure 17 illustrates a sixth embodiment of an inventive diaper schematically from above.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

20 Figure 1 shows a diaper from that side of the diaper which is intended to lie proximal to the wearer in use. The diaper is shown in a flat and extended state, i.e. in a non-assembled or open configuration. Figure 2 shows the diaper of
25 Figure 1 in a partially assembled or partial pants-type configuration, as the diaper will be seen when donned by a user, and Figure 3 shows the diaper when packaged after use, i.e. when folded together or rolled-up and secured by means of the fastener devices to form a disposable package.

30 The diaper includes a liquid-permeable casing sheet 1, an absorbent body 2 located inwardly of said casing sheet, and a liquid-impermeable casing or backing sheet 3 on the other side of the absorbent body. The casing sheets 1 and 3 and the
35 absorbent body 2 form no real part of the present invention and will therefore only be described in brief below. The liquid-permeable casing sheet 1 may be comprised of any

conventional material whatsoever, provided that it will fulfil the requirements that are normally placed on absorbent article sheet material, for instance rapid penetration of discharged fluids, low rewetting tendencies, softness and other skin-friendly properties. For instance, the casing sheet may be comprised of spun-bonded or thermo-bonded nonwoven fabric, or perforated plastic film. The casing sheet may also consist in several layers that may be bonded to one another over a more or less large surface area.

10

The liquid-impermeable casing sheet 3 may be comprised of plastic film, for instance polyethylene or polypropylene. This sheet may also consist in a multi-layer construction, for instance a laminate or an extrusion laminate.

15

Although the two casing sheets 1, 3 in Figures 1-3 are shown to have the same extension, it will be understood that these sheets may have different extensions, wherein the liquid-permeable casing sheet may have a larger extension than the liquid-impermeable casing sheet, or vice versa.

20

The extensions of the absorbent body 2 are smaller than the extensions of the two casing sheets 1 and 3 in all directions. The casing sheets 1, 3 are glued or welded together along their peripheral edge regions formed around the absorbent body 2. Naturally, the size and the location of these joining areas may vary, depending on the size relationship between the casing sheets and the absorbent body respectively. The absorbent body 3 may include any appropriate absorbent material, such as cellulose fluff pulp for instance. The absorbent material may be admixed with absorbent gel-forming polymers, also referred to as super-absorbents or SAP. These polymers may have the form of cross-linked polyacrylates.

25

30

35

The absorbent body may be joined to either one or both of the casing sheets over greater or smaller parts of its surface.

For instance, the absorbent body may be joined to the liquid-impermeable sheet by means of a number of sparsely spaced and mutually parallel glue strings applied to said layer.

5 The diaper illustrated in Figure 1 also includes elastic threads 4 and 5 provided along the side-edges 6, 7 and the end-edges 8, 9 of the diaper. Naturally, it is conceivable to use other types of elastic devices, such as elastic rubber bands or elastic foam material instead of elastic threads.

10 ~~Elastic devices may also be provided within other parts of~~ the diaper than the regions shown in Figures 1-3. The surface covered by the elastic devices may also be much larger than the relatively narrow edge-portions shown in the Figures. The number of elastic threads may, of course, also vary and may

15 be more than two or only one. Figure 1 shows the diaper in a state in which the elastic devices 4, 5 are stretched from their elastic relaxed state, whereas Figures 2 and 3 show the diaper in a state in which the elastic devices have contracted more or less.

20 The illustrated diaper includes a first end-part 10, a second end-part 11 and an intermediate crotch part 12. There are, however, no precise boundaries between the crotch part 12 and respective end-parts 10, 11. By end-part is meant in this

25 document the respective parts of the diaper which when the diaper is worn will face towards the wearer's stomach and bottom respectively. More particularly, the first end-part 10 is intended to face towards the stomach of the wearer and the second end-part 11 is intended to face towards the

30 wearer's bottom. Correspondingly, the crotch part 12 of the diaper is intended to be located between the wearer's thighs when the diaper is in use. The crotch part 12 is comprised approximately of the diaper part within which the elastic devices 4 are arranged, i.e. along a part of the diaper in

35 which the side-edges 6, 7 define an arcuate shape with the intention of forming a pair of curved side edge-parts which serve as leg openings when the diaper is worn.

The reference numeral 13 in Figure 1 identifies a contemplated longitudinally extending line which extends from one end-edge 8 to the other end-edge 9, centrally between the side-edges 6, 7. The fictive line 13 divides the diaper into two
5 longitudinally extending halves. The fictive line 13 also divides the two end-parts 10, 11 into two side end-parts 14-17, i.e. a first and a second side end-part 14, 15 in the first end-part 10, and a third and a fourth side end-part 16, 17 in the second end-part 11.

10

Fastener devices 18, 21 are mounted on respective side end-parts 14-17. The fastener devices 18-21 are of two types that have mutually complementary properties so as to be able to
15 coact with one another to form a locking connection or fastening that can be opened and re-closed repeatedly. These fastener devices will be referred to in the following as first fastener devices 18, 21 and second fastener devices 19, 20. A first fastener device 18 is mounted on the first side end-part 14, a second fastener device 19 is mounted on the
20 second side end-part 15, a second fastener device 20 is mounted on the third side end-part 16 and a first fastener device 21 is mounted on the fourth side end-part 17. The respective fastener devices 18, 19 and 20, 21 mounted on the same end-part 10 and 11 respectively are located on the same
25 respective side surface of the diaper, in other words the fastener devices 18, 19 on the first end-part 10 are located on the liquid-impermeable casing sheet 3, whereas the fastener devices 20, 21 are located on the liquid-permeable casing sheet 1. The fastener devices on the same respective
30 end-part are thus of different types. The fastener devices on the same side of the contemplated or fictive centre line are also of different types. The advantage afforded by this arrangement will be apparent when considering the diaper shown in Figure 1 in its two different states of use, i.e.
35 in the contemplated state when closed together in use, as shown in Figure 2, and the contemplated state when closed together after use, as shown in Figure 3.

When donning the diaper, two fastener devices 18, 20 and 19, 21 respectively are fastened together on the same side of the contemplated centre line 13; see Figures 1 and 2. In Figure 2, the left-hand end-parts 14, 16 of the diaper shown in Figures 1-2 are joined together by means of the first and the second fastener devices 18, 20 mounted on said left-hand side end-parts 14, 16. The right-hand side end-parts 15, 17 can be fastened together in a corresponding manner, by bringing together the first and the second fastener devices 19, 21 located on their respective right-hand side end-parts 15, 17, although this is not shown in Figure 2. Up to this point, the diaper shown in Figures 1-2 does not differ functionally from a conventional diaper which includes similar pairs of fastener devices at respective end-parts. However, the difference between the present invention and the known technique, and also the advantage afforded by the invention with the mutual positions of the two types of fastener devices shown in Figure 1 will become apparent when also studying Figure 3.

Figure 3 shows the diaper in a rolled-up state, beginning from the end-edge 9 located in the first end-part 10, i.e. that end of the diaper which is intended to be located forwardly of the wearer. As the diaper is rolled-up, the two fastener devices 18, 19 in the first end-part 10 will be rolled into the innermost part of the diaper roll, whereas the two fastener devices 20, 21 on the second end-part 11 will be accessible and can be used to fasten and secure the rolled-up diaper, by virtue of being two mutually different but complementary fastener devices. This would not have been possible if the fastener devices had been of mutually the same type on the same respective end-part.

The invention thus enables the user to fold, roll-up or package the diaper in some other way while enclosing the urine and/or faeces in a closed package with the liquid-impermeable casing sheet turned outwards. Furthermore, the

user need not worry about having to find fastener devices that are positioned particularly to this end, but is able to use the normal fastener devices, i.e. the fastener devices that are used to secure the diaper on the wearer. Furthermore, the initial direction in which the diaper is rolled-up to form a disposable package is totally irrelevant. The rolled-up diaper can also be closed and sealed when rolling-up the diaper while starting from the second end-part 11.

10 In use, respective side end-parts 16, 17 of the second and rear end-parts will overlap the first and front side end-parts 14, 15. This provides an advantageous connection from the aspect of load, this connection or fastening being subjected essentially to solely shear forces which act in the circumferential waist direction of the wearer. The connection or fastening also results in aesthetically connected side end-parts in the absence of outwardly projecting end-part flaps. When the diaper is closed in the disposal package shown in Figure 3, the fastener devices 20, 21 will be fastened in the opposite manner, i.e. with the liquid-permeable side surfaces of respective side end-parts 16, 17 facing towards each other. The fastening or connection will therewith be subjected mainly to peel forces. This is of less importance, however, since a diaper disposal package is not intended to be subjected to any considerable stresses. It is sufficient that the connection or fastening is sufficiently strong to prevent the diaper from opening out prior to being thrown into the waste bin or like refuse container.

30 The fastener devices 18-21 shown in Figures 1-3 are of the so-called touch-and-close devices, by which is meant fastener devices that consist in two parts having fastener elements which can be fastened to one another but which will not fasten individually on themselves, at least not to an extent as to obtain any appreciably strong and effective connection that is able to withstand the strains to which it is subjected, primarily not while the diaper is worn. One fastener

element may consist in a multiple of small hook-like or mushroom-like projections. Many different forms and variants of such fastener elements are commercially available and known from the patent literature, and the present invention is not restricted to any given type of hook projection. The complementary fastener element may consist in a multiple of fibre loops or the like, into which the hook-like projections are able to grip or tangle. The loop-like elements may also be freely chosen from a multiple of loop material available commercially or known from the patent literature.

As an alternative to touch-and-close fastener devices, other types of fastener devices that have two mutually complementary fastener elements can be used, for instance press studs, strap-type fasteners, buttons and button holes, or mechanically equivalent devices.

In the case of the embodiment illustrated in Figure 1, the fastener devices have been mounted directly onto one of the diaper casing sheets. As an alternative, the fastener devices can be mounted on fastener tabs at least on one end-part, suitably on the second end-part 11, in the manner known from SE 446 056 or EP 0 235 014 B1, for instance. Such fastener tabs include a fixed end which is a permanent integrated part of one or both of the diaper casing sheets, and a free end which the user can fasten to another region of the diaper. The diaper side surface on which the fastener tabs are affixed is immaterial. Each of the fastener tabs can be affixed to a respective side surface or to the same side surface or may be mounted between the two casing sheets. What is important is that the fastener devices arranged on respective fastener tabs are disposed so that in their position of use, they will be located on the same side surface of respective fastener tabs in relation to the plane of the diaper when said diaper is in its open and extended state as shown in Figure 1. The fastener devices on the fastener tabs on one and the same end-part will therewith

face in the same direction in the same manner as the fastening devices 20, 21 on the second end-part 11 in Figure 1 face in the same direction.

5 Naturally, the mutual positioning of the first and the second types of fastener devices on respective end-parts may be the reverse to that shown in Figure 1, provided that this switch is made on both end-parts at the same time, i.e. provided that the fastener devices are still of different types on the
10 same respective end-part and on the same respective side of the contemplated centre line.

It will be understood that the diaper in Figure 1 may have a shape different to that shown. For instance, the side-edges
15 of the side end-parts may be parallel instead of being non-parallel.

Figures 4-6 and 14 illustrate alternative embodiments which are identical with the diaper embodiment shown in Figure 1, with the exception of the fastener devices. Other structural
20 elements have therefore been identified with the same reference signs as those used in Figures 1-3.

Figure 4 illustrates a second embodiment of an inventive
25 diaper. The diaper shown in Figure 4 differs from the diaper shown in Figure 1 by virtue of the fact that all fastener devices 22-25 are mounted on one and the same side of the diaper, namely on the liquid-permeable casing sheet 1. In the case of this embodiment, when the diaper is donned and closed
30 to its pants-like configuration by the user, the side end-parts on the same respective side of the contemplated centre line 13 will form combined flaps which face outwardly of the wearer. Thus, the diaper connection obtained with this embodiment is not only subjected essentially to the shear
35 forces that are more favourable from the aspect of load, but instead will mainly be subjected to the less desirable peeling forces. However, this embodiment affords other

advantages. For instance, it may be beneficial from the aspect of manufacture to mount all fastener devices on one and the same side of the diaper, particularly when the individual diapers are produced by cutting the diapers from an originally continuous product web. This embodiment may also be beneficial when the article concerned is a so-called openable and re-closable pants-type diaper whose fastener devices are fastened together in conjunction with the manufacture of the pants-type diaper, for instance in the manner described in our Swedish Patent Application SE 94021227-5.

Figure 5 illustrates an embodiment which differs from the Figure 4 embodiment by virtue of the fact that the fastener devices 26-29 are four in number on each side end-part 14-17. Those edge-parts of the diaper side end-parts along which the fastener devices 26-29 are mounted will herewith be less rigid than when the fastener device extends along a distance which corresponds to the distance covered by the four smaller devices 26-29.

Figure 6 illustrates a variant of fastener devices 30-33 that are mounted on a diaper in the same positions as on the diaper shown in Figure 1, but which differ from the fastener devices 18-21 of the Figure 1 embodiment by virtue of the fact that this fastener device variant 30-33 is of a type that can be fastened to a similar fastener device. The fastener devices also include parts which enable the same type of fastener device to be fastened in one specific way to a similar fastener device mounted on the same side surface of the article and on the same end-part, but in another specific way to a similar fastener device mounted on the same side of the contemplated centre line of the diaper but on the opposite end-part, as will be explained more clearly below with reference to Figures 6-10.

The fastener devices 30-33 shown in Figures 6-10 have an S-

shape cross-section or an inverse S-shape cross-section (depending on the direction in which the profile is viewed) which form a double-hook configuration. The faster devices may be comprised of elongated profiles made of thermoplastic material, for instance polyester, polypropylene or polyethylene. The fastener devices are pliant and resilient, so that two fastener devices can be inserted one into the other and firmly clamped in a manner described in more detail below with reference to Figures 9 and 10.

10

Figure 7 illustrates a double-hook fastener device 32 on the left-side end-part of the second end-part of Figure 6, i.e. the third side end-part 16, in a cross-sectional view taken on the line A-A. The fastener device 32 includes a base part 34 and a fastener part 35 in the form of an inverted S, which in turn includes two curved segments 36, 37. The first segment 36 extends from the base-part edge 38 located proximal to the diaper side-edge 6 and extends arcuately inwards from the diaper side-edge 6. The second segment 37 extends from the first segment in the opposite direction to said segment while describing an inverted arc, i.e. extends in a direction out towards the nearest side-edge 6 of the diaper. There is formed between the base part 34 and the first segment 36 a space 39 which has an opening between the base part 34 and that part of the first segment which merges with the second segment 37. A corresponding space 40 is formed between the first segment 36 and the second segment 37, this space having a corresponding opening between the end of the second segment 37 and that part of the first segment 36 at which the base part 34 merges with said first segment.

35

The base-part 34 of the fastener device is glued or welded to the liquid-permeable casing sheet 1 of the diaper or affixed thereto in some other way. As with the earlier-mentioned fastener tapes, the base-part may instead be mounted on the liquid-permeable casing sheet 3 or between the two casing sheets 1, 3. However, the inverted S-shaped

fastener part 35 shall be mounted on that side of the diaper which is covered by the liquid-permeable sheet 1 in all cases, i.e. on that side of the diaper which faces towards the wearer in use.

5

Figure 8 is a cross-sectional view of a similar fastener device 30 on the first side end-part 14, said view being taken on the line B-B in Figure 6. This fastener device 30, however, has the difference that its S-shaped fastener part 35 extends out from that side surface of the diaper formed by the outer surface of the liquid-impermeable casing sheet 3.

The fastener device 30 thus includes a base part 41 and an S-shaped fastener part 42, which in turn includes two curved segments 43, 44. The base part 41 and the first segment 43 define therebetween a space 45, while a space 46 is defined between the first segment 43 and the second segment 44.

Figure 9 illustrates the mutual engagement of two fastener devices 32, 30 in forming a locking connection when the diaper is in use. In this case, the first and second segments 43, 44 of the fastener device 30 on the first side end-part are inserted into the space 39 on the fastener device 32 of the third side end-part, i.e. between the base part 34 of the fastener device 32 and the first fastener segment 36. The first and the second segments 36, 37 of the fastener device 32 on the third side end-part are also inserted into the space 45 in the fastener device 30 on the first side end-part, i.e. between the base part 41 of the fastener device 30 and the first fastener segment 43.

The respective inserted segments 43, 44 of the two fastener devices 30, 32 are held firmly clamped in the respective spaces 39 and 45 of the second fastener device by virtue of the suppleness and resiliency of the fastener devices. The fastener segments will deform temporarily when entering the

spaces and when located therein will spring back and clamp firmly against the inner walls of the space. The fastening connection can be easily released, however, by subjecting the fastener segments temporarily to a segment deforming force, so as to enable said segments to be withdrawn through the openings of respective recesses. The segments must also be moved sufficiently rearwards of one another to enable the segments to be moved to side of and beyond one another, so as to fully release the fastener system. It is preferred that the fastener system is constructed so that the force required to release the fastener will be sufficiently large to prevent the fastener being released unintentionally by the forces that act normally on the diaper when in use. When the diaper is intended for children, the force required to release the fastener may also be made so large as to require the strength of an adult to release the fastener. Naturally, the fastener locking force may be adapted to a magnitude which enables the wearer himself/herself to release the fastener, even when the wearer is a child.

Figure 10 illustrates the fastener device 32 (shown in Figure 7) on the third side end-part 16 in engagement with the fastener device 33 on the fourth side end-part 17, i.e. illustrates the manner in which two fastener devices on the same end-part are intended to coact with one another. When the diaper shown in Figure 6 is rolled-up into a disposal package beginning with the first end-part 10, the two fastener devices 32 and 33 on the second end-part 11 will be the only fastener devices that are accessible for use in closing the folded or rolled-up diaper. However, because the fastener devices 32, 33 are mounted on the same side surface of the diaper, the fastener devices 32, 33 are unable to engage one another in the manner shown in Figure 9, and it is necessary to twist the fastener device belonging to the one side end-part at the same time. This procedure is both time-consuming and awkward on the part of the user. However, the S-shaped fastener devices are so constructed as to enable

the right-hand fastener device 33 shown in Figure 10 (i.e. the fastener device 33 on the fourth side end-part 17) with its base part 45 and its first fastener segment 46 to be inserted through the opening of the space 40 between the first and the second fastener segments 36, 37 of the left-hand fastener device 32 (i.e. the fastener device 32 on the third side end-part 16). This insertion is shown in Figure 10. The second fastener segment 47 of the right-hand fastener device 33 has no function in this situation. Neither has the space 39 defined between the base part 34 and the first fastener segment 36 of the left-hand fastener device 32. Naturally, the two fastener devices 32, 33 shown in Figure 10 may alternatively be fastened together in the reverse manner, i.e. the left-hand fastener device 32 with its base part 34 and its first fastener segment 36 may have been inserted into the space 48 defined between the first and the second fastener segments 46, 47 of the right-hand fastener segment 33.

Correspondingly, the respective fastener devices 30 and 31 on the first end-part 10 are able to grip with one another when the diaper is instead rolled or folded so that these two fastener devices 30, 31 will be the only fastener devices that are accessible upon completion of the procedure.

Instead of using four mutually similar S-shaped double-hook fastener devices of the kind shown in Figures 6-10, there may be used in accordance with one variant only one such fastener device and three single-hook fastener devices. An embodiment which includes this variant will be described with reference to Figure 6 and Figures 11-13, wherein the fastener devices on the first, second and fourth side end-parts 14, 15 and 17 of this embodiment have the form of single hooks 49, 43, 54, while the fastener device on the third side end-part 16 has the same S-shaped double hook configuration 32 as that shown in Figures 6, 7, 9 and 10. In other respects, this embodiment is identical to the embodiment shown in Figure 6.

Figure 11 is a cross-sectional view of a single hook 49 taken on the same location in Figure 6 as the fastener device 30, i.e. on the line B-B. The single hook 49 includes a base part 50 mounted on the liquid-impermeable casing sheet 3, and a curved fastener segment 51 in the same way as corresponding parts of the S-shaped double hook 30-33. The single hook 49 differs from the double hooks 30-33 by virtue of not having a curved second fastener segment. Thus, only one space 52 into which another hook can be engaged is defined between the base part 50 and the fastener segment 51.

Figures 12-13 illustrate how the S-shaped double hooks 32 coact in two different ways with single hooks 49, 53 mounted at two different positions on the diaper shown in Figure 6.

Figure 12 is a view corresponding to the diaper fastening situation shown in Figure 9, i.e. illustrates the insertion of the fastener device, the double hook 32, together with its first and second fastener segments 36, 37 on the third side end-part 16 into the space 52 between the base part 50 of the single hook 49 of the fastener device on the first side end-part 14 and the fastener segment 51.

Figure 13 is a view which corresponds to the diaper fastening procedure shown in Figure 10, i.e. illustrates how the fastener device 32 on the third side end-part 16 is fastened to the fastener device 53 on the fourth side end-part 17, i.e. shows how two fastener devices on the same end-part are intended to mutually coact when the diaper is folded or rolled-up into a disposal package. The fastener device 53 on the fourth side end-part 17 has the form of a single hook whose base part 55 and curved fastener segment 56 are inserted into the space 40 defined in the S-shaped double hook 32 between the first and the second fastener segments 36, 37 thereof. The two embodiments illustrated in Figures 10 and 13 do not thus differ functionally in this user situation.

When using the diaper, the right-hand side end-parts 15, 17 of the diaper shown in Figure 6, i.e. the two side end-parts to the right of the contemplated centre line 13, are connected by means of two single hooks 53, 54, which provides an effective fastening as these single hooks are mounted on different side surfaces of the diaper. Notwithstanding this, the diaper according to this embodiment can be closed and sealed in its folded or rolled-up state without undue difficulty, by means of the two single hooks 49, 54 on the first end-part 10, due to the fact that the single hooks in this configuration will be located on the same side and having their respective fastener segments directed away from each other.

Figures 14-16 illustrate another embodiment in which four fastener devices 57-60 are mounted on the four side end-parts 14-17 of the diaper. The illustrated fastener devices 57-60 are comprised of upstanding elongated projections of U-shaped cross-section, of which the fastener device 59 on the third side end-part 16 is shown in cross-section in Figure 15, taken on the line C-C in Figure 14. The fastener device 59 has a base part 61, which is affixed to the liquid-permeable casing sheet 1 and extends in the same plane thereas, two walls 62, 63 which are upstanding from the base part 61, and a roof 64 which extends between the two walls 62, 63. The two walls 62, 63 slope slightly towards one another from the roof or web 64 to the base part 61.

The two casing sheets 1, 3 present an opening 65 between the two walls 62, 63, the width of this opening being approximately equal to the distance between the two walls 62, 63. The opening also extends essentially along the full length of the fastener device 59. An inner groove or channel is formed within the opening 65, between the walls 62, 63 and the roof 64. The walls 62, 63 and the roof 64 also form at the same time an outer channel in the form of a projection 66 upstanding from the base part 61. When mutually coupling

two fastener devices of this kind, the projection of one device is inserted into the internal channel of the other device; see Figure 16.

5 The three remaining fastener devices 56, 58 and 60 are in principle constructed in the same way and are all mounted on the liquid-permeable casing sheet 1 of the diaper with an opening through the two casing sheets 1, 3 located generally
10 opposite to and extending along the internal channel of respective fastener devices.

15 The fastener devices 57-60 may be comprised of thermoplastic material or some other resilient material. They need not be comprised of one single elongated U-like profile, but may be comprised of several discrete profiles disposed in a selected
20 pattern within respective side end-parts, although conveniently in patterns which match each other on mutually adjacent side end-parts of the same end-part or on the same respective side of the contemplated centre line 13. Neither
25 need the profile have a U-like shape, since any configuration is conceivable that will allow one fastener device to fit into another.

25 The fastener devices 57-60 of the Figure 14 embodiment have three mutually different sizes with regard to channel width and channel height, i.e. the distance between the walls and the distance from the roof to the base part. In this regard, the fastener device 57 on the first side end-part 14 is
30 larger than the fastener devices 58, 59 on respective second and third side end-parts 15, 16 which are mutually of the same size, said fastener devices 58, 59 being, in turn, larger than the fastener device 60 on the fourth side end-part 17, this latter fastener device thus being the smallest of the four devices.

35 The size difference between the fastener devices 57-60 is such as to enable a fastener device of given size to fit into

and be coupled together with a fastener device of the next largest size.

Thus, when using the diaper, the fastener device 57 on the first side end-part 14 is coupled to the fastener device 59 on the third side end-part 16, shown in Figure 16, by inserting the projection 67 on the fastener device 59 into the inner channel 67 of the fastener device 57.

Similarly, the fastener devices 58, 60 on the right of the contemplated centre line can be coupled together to form a pants-like configuration in use. After use, the diaper can be rolled-up and closed in the manner shown in Figure 3, by fastening the smaller of the two fastener devices 58 or 60 on one of the end-parts 10 or 11, to the larger fastener device 57 or 59 on the same end-part 10 or 11 respectively. As will be understood, the positions of the three mutually connectable fastener devices 57-60 of mutually different size are not restricted to the position shown in Figure 14, for instance such that the smallest fastener device 60 must be mounted on the second and rear end-part 11. For instance, a selected number of all fastener devices can be moved through one-quarter of a turn in a clockwise or anti-clockwise direction, so that the respective fastener devices 57-60 will be located on a side end-part other than that shown in Figure 14, provided that the mutual positioning between the fastener devices is maintained.

Because the fastener devices are resilient, the fastener devices will be deformed slightly when one fastener device is inserted into the other, and will then spring back and tightly abut respective walls and roofs so as to provide a mechanical locking action. As in the case of the aforescribed S-shaped fastener devices, the force required to release the fastener will be greater than the force to which the diaper is normally subjected to in use.

It will be understood that a number of variants are possible within the scope of the invention, and that the invention is restricted solely by the scope of the following Claims.

5 For instance, each side end-part 14-17 may include two mutually different and mutually coacting types of fastener devices, for instance both a hook element and a loop element of a touch-and-close fastener. Figure 17 shows one such example in which a hook-type fastener-element 68 and a loop-type fastener-element 69 of a touch-and-close fastener have been positioned alternately in a row in respective side end-10 parts 14-17. A loop fastener-element 69 is mounted nearest the end-edge 9 of the first side end-part 14, followed by a hook fastener-element 68, which in turn is followed by a further loop fastener-element 69, which is followed by a further hook fastener-element 68. The sequence on the second15 end-part 15 begins with a hook fastener-element 68 nearest the end-edge 9 and terminates with a loop fastener-element 69. On the third side end-part 16 of the second end-part 11, a hook fastener-element 68 is mounted nearest the end-edge20 8, this fastener element being followed by a loop fastener-element 69, a further hook fastener-element 68 and finally a further loop fastener-element 69. Finally, the sequence of fastener elements on the fourth side end-part starting from the end-edge 8 is the same as that on the first side end-part25 14, counting from its nearest end-edge 9. In principle, the embodiment illustrated in Figure 17 functions in the same way as the embodiment illustrated in Figure 1, although each side end-part includes two mutually different fastener devices instead of only one. Naturally, formations other than a30 single row of the two different types of fastener devices are conceivable, for instance groups comprising several rows and columns, triangular groups, etc. The relative distance between the individual fastener devices in one and the same side end-part can also vary.

For the sake of clarity, the four side end-parts of the

described embodiments have been identified with ordinal numbers and different types of fastener devices have been described as being placed on specific side end-parts. In order to be on the safe side in this regard, it is mentioned

5 that the "third" side end-part may just as well be the "first" side end-part within the scope of the wording of the Claims, and that a fastener device which has been said to be mounted on a given side end-part in one embodiment can equally as well be mounted on one of the other three end-

10 parts. It is solely the mutual relative positions of the different fastener devices that is significant to the invention. For instance, if the hook fastener-element in Figure 1 is changed for the loop fastener-element on the same end-part, then the two hook fastener-elements and loop

15 fastener-elements on the other end-parts must also change places.

CLAIMS

1. An absorbent article such as a diaper or an openable and re-closable pants-type diaper, comprising a first side which
5 is intended to lie proximal to the wearer in use, a second side which is intended to lie distal from the wearer in use, first and a second end-parts (10, 11) which in use are intended to lie against the front part and the rear part of
10 the wearer respectively, and a crotch part (12) located between the two end-parts (10, 11) and intended to lie between the wearer's thighs in use, wherein the article also includes a fastener system by means of which the end-parts (10, 11) of the article can be closed from a non-assembled or open configuration to form a pants-type configuration, and
15 by means of which the end-parts (10, 11) can be loosened from an assembled or closed pants-type configuration to a non-assembled or open configuration, wherein the fastener system includes mutually coacting fastener devices (18-21; 22-25; 26-29; 30-33; 49, 32, 53, 54; 57-60; 68, 69), wherein the
20 article also includes two side-edges (6, 7) which delimit the article in its non-assembled configuration in a transverse direction, wherein each end-part (10, 11) has in the non-assembled configuration of the article an end-edge (8, 9) which delimits the article in its longitudinal extension in
25 the non-assembled configuration of said article, and wherein the article includes a contemplated longitudinally extending line (13) which extends from one end-edge (8) to the other end-edge (9) centrally between the side-edges (6, 7), said line (13) dividing respective end-parts (10, 11) into a
30 respective first and a respective second side end-part (14-17), characterized in that at least one of the end-parts (10, 11) on one and the same first or second side of the article includes fastener devices (18, 20; 22, 24; 26, 28; 30, 32; 49, 32; 57, 59; 68, 69) on the first side end-part (14, 16),
35 which fastener device or which fastener devices (18, 20; 22, 24; 26, 28; 30, 32; 49, 32; 57, 59; 68, 69) can coact with one or more fastener devices (19, 21, 23, 25; 27, 29; 31, 33;

54, 53; 58, 60; 68, 69) on the second side end-part (15, 17) on the same end-part (10, 11); and in that respective side end-parts (14, 15) on the one end-part (10, 11) include fastener devices (18, 19, 22, 23; 26, 27; 30, 31; 49, 54; 57, 58; 68, 69) that can coact with fastener devices (20, 21; 24, 25; 28, 29; 32, 33; 32, 53; 59, 60; 68, 69) on the second end-part (11) on side end-parts (16, 17) on respective same sides of the contemplated line (13) between the end-edges (8, 9).

10

2. An absorbent article according to Claim 1, characterized in that the first side end-part (14) of the first end-part (10) includes at least one first type of fastener device (18; 22; 26; 30; 69) and the second side end-part (15) of said first end-part (10) includes at least one second type of fastener device (19; 23; 27; 31; 68); in that the second end-part (11) includes fastener devices of the first (21; 25; 29; 33; 69) and the second type (20; 24; 28; 32; 68) in reversed relationship with the contemplated centre line (13) in comparison with the fastener devices (18; 22; 26; 30; 69 and 19; 23; 27; 31; 68) on the side end-parts (10, 11) of the first end-part.

3. An absorbent article according to Claim 1, characterized in that the fastener system includes a first type of fastener device (57) that can coact with a second type of fastener device (58, 59); in that the second type of fastener device (58, 59) can coact with a third type of fastener device (60); in that the first side end-part (14) of the first end-part includes at least one first type of fastener device (57); in that the second side end-part (15) on the opposite side of the contemplated centre line (13) includes at least one second type of fastener device (58); in that the second end-part (13) includes a fastener device of the second type (59) on a side end-part (16) on the same side of the contemplated centre line (13) as the first side end-part (14) on the first end-part (10); and in that the second end-part (11) includes

a fastener device of the third type (60) on the side end-part (17) on the other side of the contemplated centre line (13) in relation to the first side end-part (14) on the first end-part (10).

5

4. An absorbent article according to any one of the preceding Claims, characterized in that all fastener devices (22-25; 26-29; 57-60) are mounted on the same first side or the same second side of the article.

10

5. An absorbent article according to any one of Claims 1-3, characterized in that the fastener devices (18-19; 30-31; 49, 54; 68, 69) on the first end-part (10) are mounted on the same first side or the same second side of the article, whereas the fastener devices (20-21; 32-33; 32, 53; 68, 69) on the second end-part (11) are mounted on opposite first or second sides of the article in relation to the fastener devices (18-19; 30-31; 49, 54; 68, 69) on the first end-part (10).

20

6. An absorbent article according to any one of the preceding Claims, characterized in that the fastener devices (18-21; 22-25; 26-29; 30-33; 49, 32, 53, 54; 57-60; 68, 69) are mechanical fastener devices, such as touch-and-close fasteners, press studs, preferably vacuum-formed press studs, buttons and button holes, profiled devices of S-shaped cross-section, inverted S-shaped cross-section or U-shaped cross-section, or equivalent devices.

25

7. An absorbent article according to any one of the preceding Claims, characterized in that the fastener devices are of a type (30-33) which can coact with a similar fastener device (30-33), for instance an S-shaped or an inverted S-shaped profile.

30

8. An absorbent article as claimed in claim 1 substantially as hereinbefore described with reference to and as illustrated in any one of Figures 1 to 3, 4, 5, 6 to 10, 11 to 13, 14 to 16 or 17 of the accompanying drawings.



The
Patent
Office

- 33 -

Application No: GB 9613654.4
Claims searched: 1 to 8

Examiner: Robert Crowshaw
Date of search: 24 September 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A3V

Int Cl (Ed.6): A61F 13/15

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2227923 A (GRANTHAM) See especially the first and second connecting means 16 & 20 in figure 1.	1, 7
X	GB 2164542 A (PERRICONE) See especially fastening tapes 11,12,14,15 in figure 3.	1, 7
X	EP 0323634 A2 (KIMBERLEY-CLARK) See especially the arrangement of poppers in figure 2.	1, 2, 5, 6, 7
X	US 4895569 (KIMBERLEY-CLARK) Whole document relevant, but see especially column 6 lines 12-29, and the arrangement of poppers in figures 1 and 2.	1, 2, 3, 4, 5, 6, 7
X	US 4834742 (KIMBERLEY-CLARK) Whole document relevant, but see especially column 4 lines 50 to column 5 line 4, and the arrangement of poppers in figures 1 and 9.	1, 2, 3, 5, 6, 7
X	US 3916901 (KORGEMETS) See especially the connecting means 26 in figure 1.	1, 7

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.